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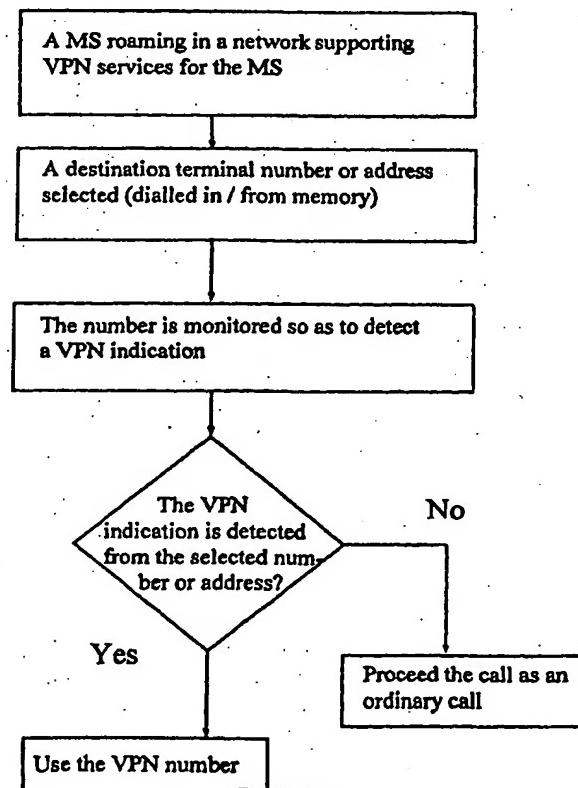
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(54) Title: METHOD AND ARRANGEMENT FOR ESTABLISHING A CALL

(57) Abstract

The invention relates to a method of establishing a connection from a mobile station to a destination terminal, wherein the connection is made through a mobile communication network serving said mobile station. The method comprises steps of selecting a destination number, monitoring the selected destination number and detecting the type of the selected number by control means of the mobile station. In case the selected number is a number of a Virtual Private Network and the serving mobile communication network supports Virtual Private Network calls, Virtual Private Network format is used for the call. In other case a full-length format of the destination number is used for the call. The method relates further to a mobile station accomplishing the method.



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**METHOD AND ARRANGEMENT FOR ESTABLISHING A CALL****FIELD OF THE INVENTION**

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The present invention relates to a method of establishing a connection from a mobile station to a desired destination number, said destination number being an extension number of a Virtual Private Network (VPN). The invention relates 10 further to an arrangement for performing call establishment operations to extension numbers of a Virtual Private Network.

**BACKGROUND OF THE INVENTION**

15

The present telecommunication systems include so called Virtual Private Networks (VPN) providing a flexible and modern solution of telecommunications, such as for transmitting speech and/or data, for various organisations.

20

The VPN can be defined as a system enabling an organisation, such as a company, with geographically spread units to use some of the resources of a public network, such as PSTN (Public Switched Telephone Network) or PLMN (Public Land Mobile Network) or an open data network (e.g. Internet), for

25

intra-company traffic. The VPN network is interconnecting a number of PBXs (Private Branch Exchanges) Centrex groups, and/or individual subscribers in a private network with special numbering and/or charging and/or service plans. Usually the VPN is implemented by means of a Intelligent

30

Network (IN) or then by using ordinary number analysis trees. The VPN enables the organisation to interconnect several PBXs or similar switching or routing apparatus to form a single network without having to lease the lines from operators. The terminals, such as telephones, computers,

35

workstations etc., connected to the VPN are seen as extensions, and the telephone numbers or addresses thereof are thus extension numbers or addresses of the VPN.

As mentioned above, a mobile station can be named as one member (i.e. extension) of the VPN group. When the mobile station is the member of a VPN, abbreviated extension  
5 numbers of the other members of the VPN can be used directly to reach the terminals of the other members. Mobile telephones or mobile stations in general have also memory facilities enabling the users thereof to store desired telephone numbers. The numbers can be stored in a Subscriber  
10 Identity Module (or SIM card) inserted in the mobile station and/or in another type of memory, fixed or replaceable, provided in the mobile station. It is also possible to store the abbreviated extension numbers of the VPN group in the memory means provided in connection with the mobile station.

15

#### SUMMARY OF THE INVENTION

Even though the VPN systems have provided some remarkable advantages to the users thereof, there are still some  
20 shortages in the existing VPN systems. For instance, in cases where the user is outside his home networks, the abbreviated extension numbers cannot be used. Instead, the user has to dial in or select from the number memory of the mobile station a full length format (international)  
25 telephone number. For example, for abbreviated extension number 1234 at LM Ericsson in Finland (LMF), the full length international format is +358 9 299 1234. When situated in Finland, a VPN call from a telephone belonging to the LMF VPN to this number can be made by simply selecting 1234.  
30 However, when abroad, the full length format must always be used and the LMF VPN service and/or pricing is not available for the member even though he is calling to a number which is indeed said LMF VPN number and this part of the VPN group.

35

Even though some of the state of art network system enable separation of the VPN calls from other calls by means of an

IN implemented within the network, the present implementations of the VPN service (IN service or number analysis tree) are not always clever enough to handle the calls correctly such that the VPN calls could be separated from full length numbers stored in the telephone (i.e., in case the full length number is used, the system handles the call as a "normal" call). Therefore, in case the user wishes to use the VPN numbers when in home network and the international format when abroad, the user needs to store both of the number formats in his telephone and then manually select which one of the numbers to use. In case only the international format is stored, the calls made by selecting this long number will not necessarily be handled as VPN calls, regardless the fact that the user is within his home network. Abbreviated VPN extension numbers will not work when the MS is outside the home network.

It is an object of the present invention to overcome the above shortages of the prior art solutions and to provide a new type of solution for establishing a VPN call. Another object of the present invention is to provide a method and arrangement by means of which the need to store to the memory of a mobile station more than one number for the extension of the VPN and a manual selection of the correct number is avoided.

According to a first aspect, the objects are obtained by a method of establishing a connection from a mobile station to a destination terminal, wherein the connection is made through a mobile communication network serving said mobile station. The method comprises selecting a desired destination number or address, monitoring the selected destination number or address and detecting the type of the selected number or address by control means of the mobile station, wherein, in case the selected number or address is detected to be a number or address of a Virtual Private Network and the serving mobile communication network

supports Virtual Private Network calls, Virtual Private Network format is used for the call, and in case the serving mobile communication network does not support Virtual Private Network format, full-length format of the 5 destination number or address is used for the call.

According to a second aspect, the invention discloses a mobile station for use in telecommunication system consisting of several telecommunication networks, wherein a 10 Virtual Private Network service is implemented to at least one of the telecommunication networks. The mobile station comprises memory for storing telephone numbers, wherein the telephone numbers can be stored in a full length format and in a Virtual Private Network format, selection means for 15 selecting a desired destination number, detection means for monitoring the selected number, wherein the arrangement is such that in case the detection means detect the selected number to be a number of a Virtual Private Network service and the serving mobile communication network supports 20 Virtual Private Network calls, the mobile station establishes the call set up procedures by using Virtual Private Network format, and in other cases the mobile station initiates the call set up procedures by using the full length format.

25 According to a more derailed aspects the number for Virtual Private Network calls stored in the memory includes a number and/or character string indicating that the number is a Virtual Private Network number. A special mark or indication 30 can also be stored together with the number indicating that the number is a Virtual Private Network number. The selection of the desired destination number may comprise steps of selecting an ordinary telephone number, retrieving an associated telephone number from the memory of the mobile 35 station and using the associated telephone number for establishing a Virtual Private Network call. According to a further alternative the method comprises steps for selecting

an abbreviated VPN format of the destination number or address, detecting that the mobile communications network does not support Virtual Private Network for the mobile station in use, and retrieving a full length format of the 5 destination number or address from the memory. The indication of the capability of the serving mobile communication network to support Virtual Private Network services for said mobile station can be based on one of a list 10 of networks supporting the Virtual Private Network Services provided in said mobile station, an indication transmitted to said mobile station by the serving mobile network, or an indication given by the user of said mobile station.

The proposed solution makes it possible to store only one 15 format (usually the longest version) of a telephone number for a VPN extension, while the mobile station automatically selects and uses the VPN number whenever it is possible, regardless of the "intelligence" and capabilities of the used 20 VPN service and network apparatus. It becomes also possible to use abbreviated VPN extension numbers outside the service area of the home network, i.e. when being abroad.

In the following the present invention and the other objects 25 and advantages thereof will be described in an exemplifying manner with reference to the annexed drawings, in which similar reference characters throughout the various figures refer to similar features.

#### BRIEF DESCRIPTION OF THE DRAWINGS

30

Figure 1 is a schematic presentation of a telecommunication arrangement comprising a VPN;

Figure 2 discloses, partially in section, a mobile phone provided with memory facility;

35 Figure 3 is a flow chart for the operation in accordance with one embodiment; and

Figure 4 is a flow chart for the operation in accordance

with another embodiment.

DETAILED DESCRIPTION OF THE DRAWINGS

5     Figure 1 is a schematical simplified presentation of a telecommunication arrangement comprising a Virtual Private Network (VPN) 10. The VPN service is implemented by means of an Intelligent Network (IN) 15 of a Public Switched Telephone Network (PSTN) 13. A Public Land Mobile Network (PLMN) 11, such as GSM, PDC, AMPS, D-AMPS, UMTS etc., is connected to the PSTN by suitable linking apparatus and/or gateways 12. A mobile station (MS) 1 is also shown as communicating with the PLMN over a radio connection between the serving PLMN network apparatus and the MS 1.

15     Various components of the PSTN and PLMN networks are per se known to the skilled person, and are not described here in more detail since they are not forming an essential part of the invention. It is also noted here that it is possible to 20 implement the IN also in connection with the PLMN, or as an arrangement that is separate from both the PLMN and the PSTN.

25     Figure 1 discloses two extension terminals of the VPN, namely the MS 1 served by the PLMN and a fixed line terminal 14 connected to the PSTN. In the example disclosed later on the MS 1 (A-number or A-subscriber) establishes a call to the extension terminal 14 (B-number or B-subscriber). The other extension terminals of the VPN group have been omitted 30 for the purposes of clarity.

35     Figure 2 discloses a partially sectioned mobile telephone 1 including a Subscriber Identity Module (SIM) card 2 and a Central Processing Unit (CPU) 5 or similar controller. In addition, the mobile telephone 1 is illustrated to comprise a display 3, dialling key pad 7 and Y (yes, e.g. for accepting a number selection and initiating a call) and N

(no, e.g. disconnection of calls) buttons 4 and 6, respectively. It is noted here that the mobile station can be of other type as well, such as an integrated unit of a mobile telephone and a computer. In addition, the

5 destination terminal number selection or called party name selection can also differ from the selection by means of dialling the keypad, and can thus be done e.g. by means of voice activation etc.

10 The SIM 2 can be used as memory for storing desired numbers into the telephone. However, it is noted that it is also possible to use other memory means provided for the storage of the desired telephone numbers. When a number belonging to the same VPN group is stored in the memory, it can be done

15 in a full length (international) format. When making a phone call, a special VPN indication (such as a predefined number and/or character string, mark, flag or similar) embedded into the number is used to indicate to the control means of the mobile telephone that the number is a VPN number. For

20 instance, the arrangement may be such that the CPU 5 knows all B-numbers beginning with +358-9-299 or with 09-299 to be numbers for VPN calls and proceeds accordingly whenever such a number is selected. According to an alternative a special mark or flag is inserted to precede each of the VPN numbers

25 or is embedded into the number. This indication is then detected by the control means, such as the CPU 5 or similar processor, monitoring the selected numbers before initiating the call set-up signalling.

30 Referring now also to the flow chart of figure 3, the operation in accordance with one embodiment is described in situation where the MS 1 is roaming in its home network (in figure 1 this would be PLMN 11) or any other network supporting VPN services for that MS (e.g. through agreements

35 between different operators). The user selects desired destination terminal, where after the number or address indicated to the control unit of the MS is retrieved from

the memory of the MS. The retrieved number is monitored so as to detect any indication of a VPN number. In case the selected telephone number is detected to be a telephone number of a Virtual Private Network and the serving mobile 5 telephone network supports Virtual Private Network calls, this Virtual Private Network format is used for initiating and processing the call. In case the serving network does not support Virtual Private Network format, a given telephone number format can be used for processing the call 10 further.

The mobile station MS has to know whether the serving mobile communication network supports VPN services and calls for this particular MS or not. Therefore the MS has to be 15 provided with an indication of this capability of the serving mobile communication network to support Virtual Private Network services for said mobile station. According to one alternative a list of networks supporting the Virtual Private Network Services for that subscription is provided 20 in said mobile station, either in the SIM card or other memory of the MS. The indication can also be transmitted to said mobile station by the serving mobile network after the MS has been switched on or has roamed in the service area of the serving network. In addition, the user may manually give 25 an indication to said mobile station, e.g. by a menu selection or dialling in a predefined number/character or string, that the MS is now served by a network supporting VPN calls for said MS.

30 Figure 4 discloses a flow chart for a situation in which the MS is roaming in and served by such network that does not support VPN services for that particular MS. Despite this, the arrangement is such that user may select the desired destination terminal by using the abbreviated VPN number 35 (e.g. three or four digit number). In case the MS detects that VPN numbers cannot be used, the long format number or address is retrieved from the memory of the MS. As the MS is

capable of performing the selection of the correct format of the destination number, the user will transparently establish VPN call and "normal" calls without a need to pay any attention to the selection of the number.

5

For those instances or networks where there exists some "official" abbreviated numbers which may have some other destinations than the VPN network, such as emergency (e.g. 112 or 911), it might be necessary to take these numbers into account when making the directory number plan in order to avoid a situation where somebody of the VPN group would receive a such abbreviated VPN number which is an official number in some of the PLMN networks. This can also be avoided by an arrangement in which the abbreviated VPN numbers must always be preceded or followed by some agreed digit, e.g. by a \* or #, or number or number series, e.g. 77, or then the selection could be confirmed by a suitable menu selection (e.g. by selecting "VPN CALL" from the menu of the telephone). According a further alternative, the arrangement could also be such that the official numbers are preceded or followed by a special digit etc. while the abbreviated VPN numbers can be dialled in and used as such.

When mobile stations are members of a VPN group, they do not necessarily have any common prefix, but the telephone numbers thereof may be any directory numbers given from the operator's number space. If the user of the VPN extension uses full length format of the destination number of a mobile station MS (i.e. full length B-number), it is possible that the call will not be handled as a VPN call, since the network does not necessarily recognise the destination number to be a part of the VPN group. To avoid this the prior art systems have often used a special prefix (e.g. 55) for routing the call through the VPN service to the called MS. This prefix is often attached in front of the abbreviated VPN number (e.g. 55 1234).

However, the present invention provides a solution to this problem as well. The solution is to store an VPN extension number in the memory of the MS and associate it together  
5 with a full length number also stored in the memory of the MS. If the full length number is selected, this associated VPN number will then be retrieved and used instead of the originally selected number, in case the serving network supports VPN calls for the particular MS. The associated VPN  
10 number can be retrieved together with (prestored) prefix. By means of this the VPN number will be used despite the fact that the user may select (e.g. by mistake) some other format of the destination B-number. The associated number is provided with an indication that it is a VPN number,  
15 whereafter the call is processed as a VPN call. This selection of the associated number can be done dynamically or then the user of the second MS may select the associated number manually, e.g. by means of menu selection.

20 Example where the above could be used include occasions where an extension of a VPN group makes an unsuccessful call attempt to a MS extension of the same VPN group or where the number of a calling extension has been stored in the memory of the MS. The MS will then later on display the A-number it  
25 received from the network, and this A-number is often used for calling back. As the received and displayed A-number may not be a VPN number, the above described association can be used to ensure that the VPN number is used and that call will be processed as a VPN call.

30 Thus, the invention provides an apparatus and a method by means of which the user is provided with a transparent possibility of always receiving the benefits of a VPN connection whenever this is possible. The arrangement  
35 according to the present invention is easy and economical to realise by per se known components and reliable in use.

It is noted that the foregoing examples of the embodiments of the invention are not intended to restrict the scope of the invention to the specific forms presented above but the present invention is meant rather to cover all  
5 modifications, similarities and alternatives which are included in the spirit and scope of the present invention, as defined by the appended claims.

## CLAIMS

1. Method of establishing a connection from a mobile station to a destination terminal, wherein the connection is made through a mobile communication network serving said mobile station, comprising
  - 5 selecting a desired destination number or address;
  - monitoring the selected destination number or address and detecting the type of the selected number or address by control means of the mobile station;
  - 10 wherein, in case the selected number or address is detected to be a number or address of a Virtual Private Network and the serving mobile communication network supports Virtual Private Network calls, Virtual Private
  - 15 Network format is used for the call, and in case the serving mobile communication network does not support Virtual Private Network format, full-length format of the destination number or address is used for the call.
- 20 2. Method in accordance with claim 1, wherein the detection is based on detection of a number or character string in the destination number or address, said string indicating that the number or address is a Virtual Private Network number or address.
- 25 3. Method in accordance with claim 1, wherein the detection is based on detection of a special Virtual Private Network mark or indication in the selected destination number or address, said mark or indication indicating that the number or address is a Virtual Private Network number or address.
- 30 4. Method in accordance with any of the preceding claims, wherein the indication of the capability of the serving mobile communication network to support Virtual Private
- 35 Network services for said mobile station is based on one of:

a list of networks supporting the Virtual Private Network Services provided in said mobile station,  
an indication transmitted to said mobile station by the serving mobile network, or  
5 an indication given by the user of said mobile station.

5. Method in accordance with any of the preceding claims, wherein the number or address is selected among destination numbers or addresses stored in a memory provided in the  
10 mobile station.

6. Method in accordance with claim 5, wherein the memory consists of a Subscriber Identity Module (SIM) installed in the mobile station.  
15

7. Method in accordance with claim 5 or 6, further comprising:

selecting an abbreviated VPN format of the destination number or address;

20 detecting that the serving mobile communications network does not support Virtual Private Network for the mobile station in use; and

retrieving a full length format of the destination number or address from the memory.  
25

8. Method in accordance with any of the preceding claims, wherein said selection of the desired destination number comprises:

selecting an ordinary telephone number;

30 retrieving an associated telephone number from the memory of the mobile station; and

using the associated telephone for establishing a Virtual Private Network call.  
35

9. A mobile station for use in telecommunication system consisting of several telecommunication networks, wherein a

Virtual Private Network service is implemented to at least one of the telecommunication networks, comprising

memory for storing telephone numbers, wherein the telephone numbers can be stored in a full length format and  
5 in a Virtual Private Network format;

selection means for selecting a desired destination number;

detection means for monitoring the selected number, wherein the arrangement is such that in case the detection  
10 means detect the selected number to be a number of a Virtual Private Network service and the serving mobile communication network supports Virtual Private Network calls, the mobile station establishes the call set up procedures by using Virtual Private Network format, and in other cases the  
15 mobile station initiates the call set up procedures by using the full length format.

10. A mobile station in accordance with claim 9, wherein the number for Virtual Private Network calls stored in the  
20 memory includes a number and/or character string indicating that the number is a Virtual Private Network number.

11. A mobile station in accordance with claim 9, wherein a special mark or indication is stored together with the  
25 number indicating that the number is a Virtual Private Network number.

12. A mobile station in accordance with any of claims 9 to 11, wherein the memory consists of a Subscriber Identity  
30 Module (SIM) installed in the mobile station.

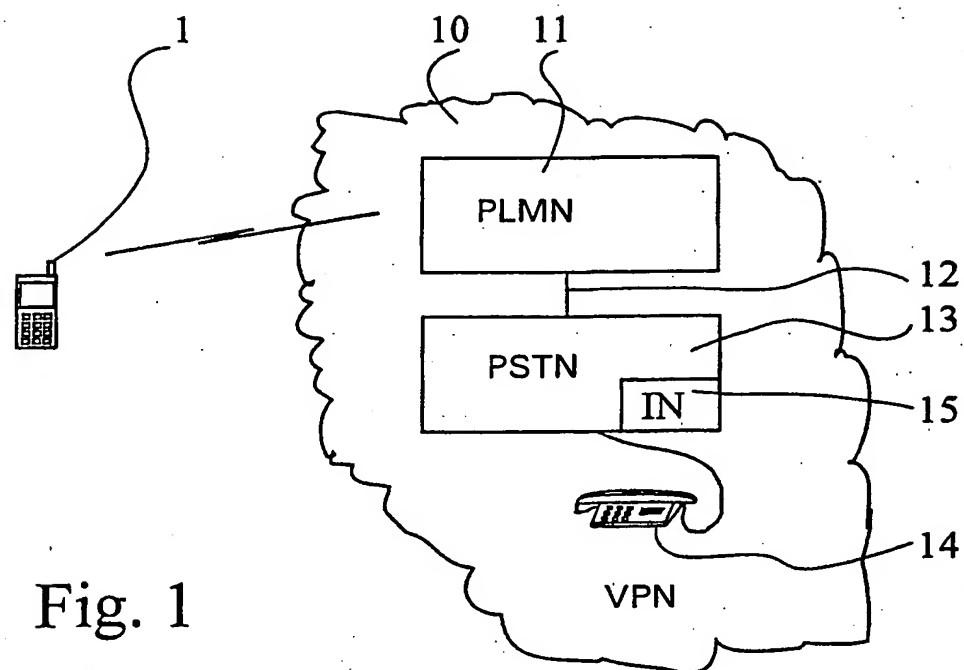


Fig. 1

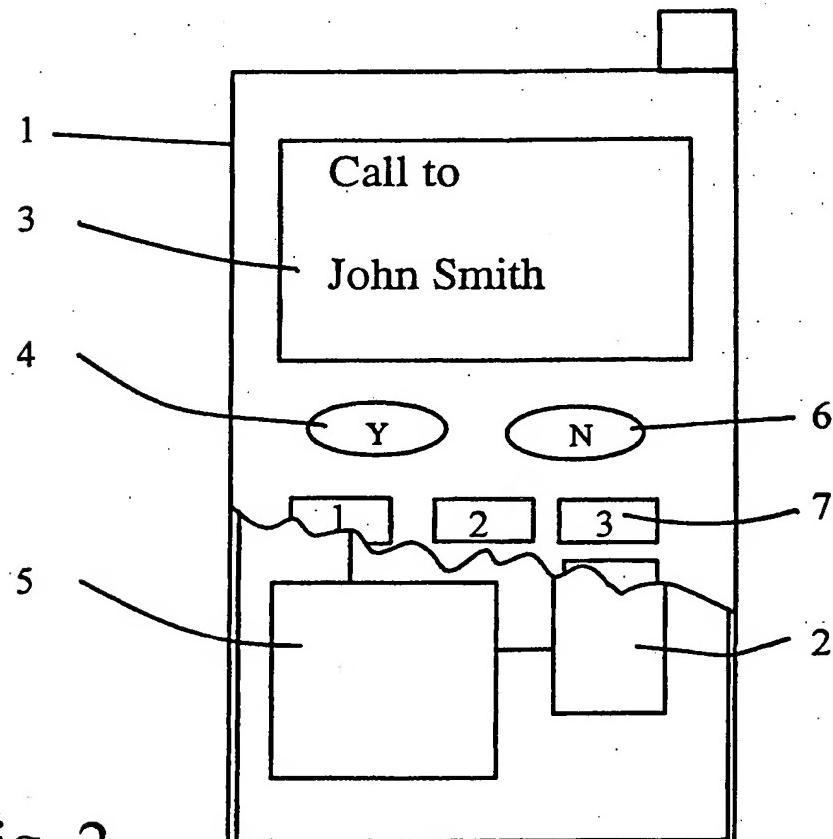


Fig. 2

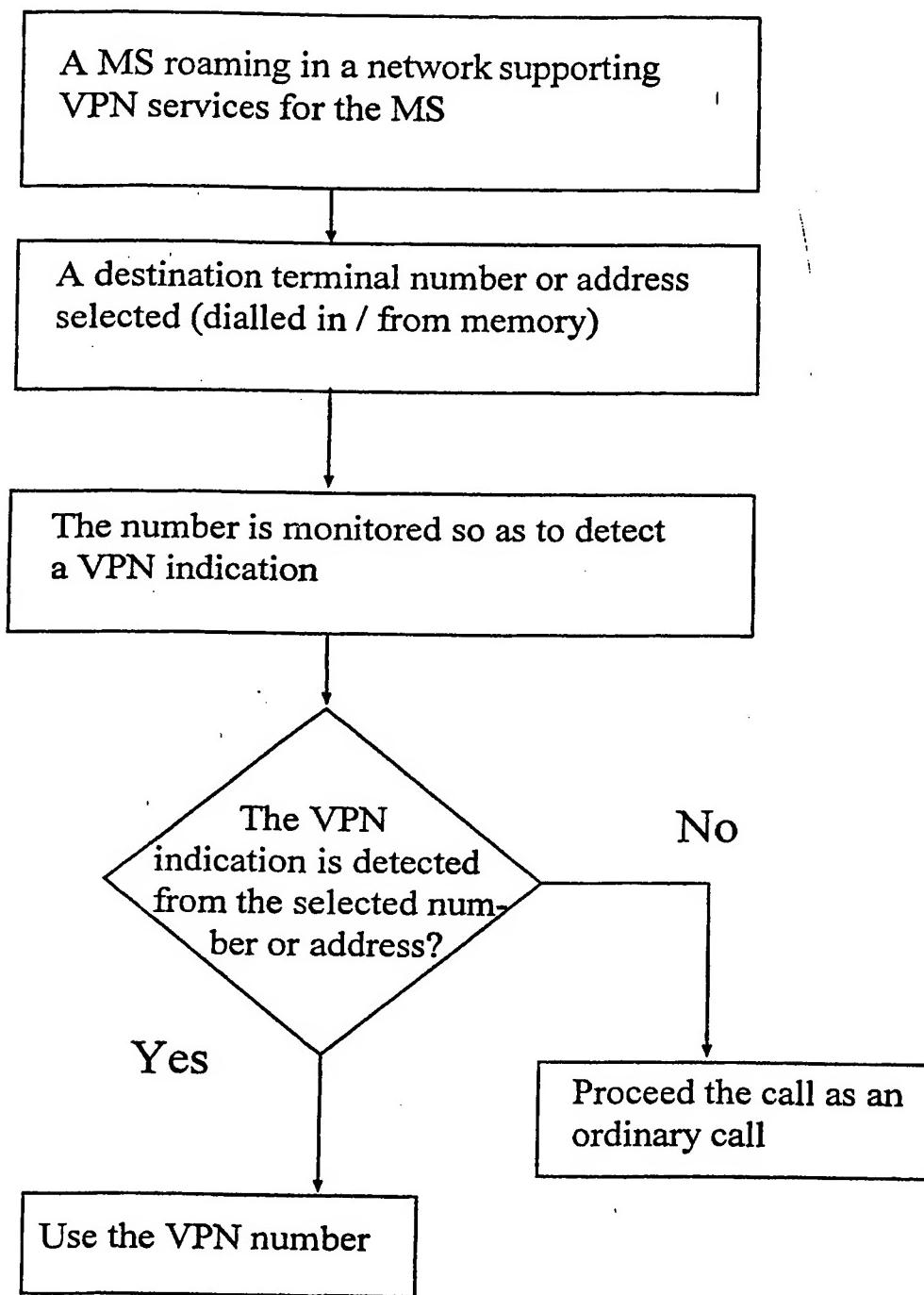


Fig. 3

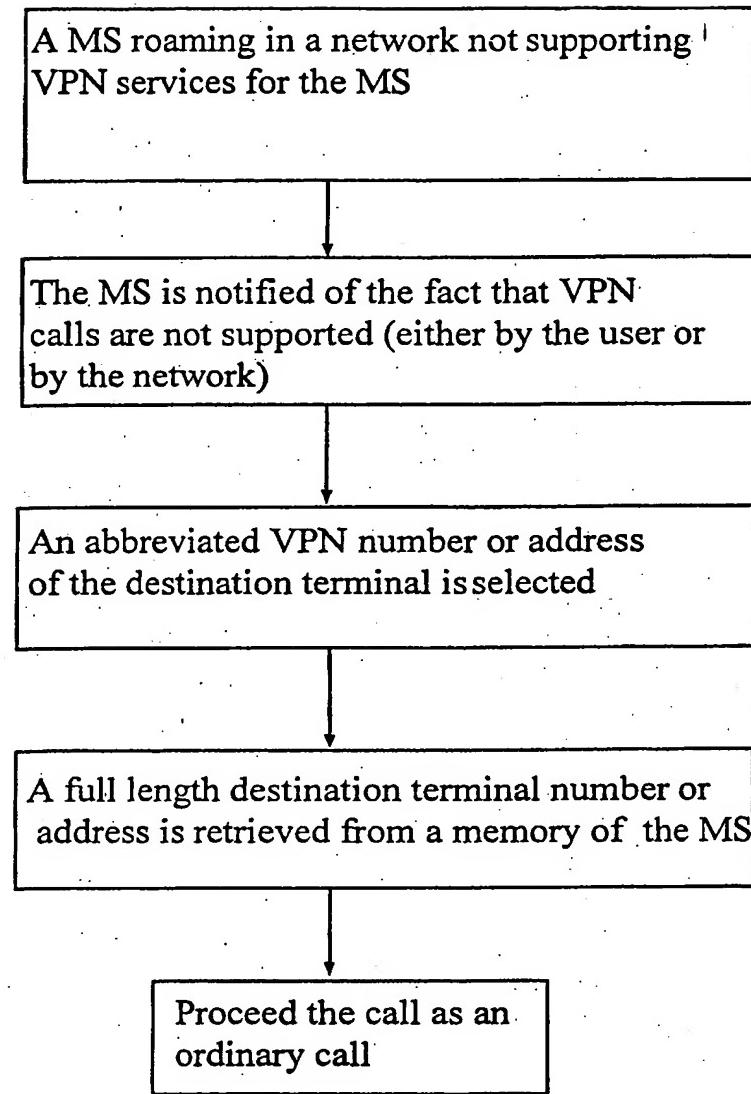


Fig. 4

## INTERNATIONAL SEARCH REPORT

Int'l Application No

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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H04M1/274 H04Q7/38

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

Int'l. Search Application No

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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